

cases can now be safely conducted through capital operations, that formerly would have been deemed unable to bear any surgical interference.

"Before quitting this subject, I must mention a case recorded by a most careful and accurate observer, my friend and former instructor Mr. Paget, of which he remarks: 'It was very observable that the ill effect of chloroform was exercised on the heart more than, and earlier than, on the muscles of respiration.' A man labouring under tetanus inhaled chloroform, and 'was brought under its full influence. I was trying to open his mouth, but the face was still fixed and white; still trying, we saw him become extremely pale, and then bluish about his lips and nose, then he began to breathe heavily and frothed at the mouth, and his pulse, which had been irregular during the inhalation of the chloroform suddenly stopped; his heart ceased to beat, and in a few seconds more he ceased to breathe, became motionless, with his limbs flaccid. He was to all appearance dead, and thus he remained for about a minute and a half, when again his heart began to act, blood returned to his face, and his pulse again became full, when he began to breathe again, and presently he breathed freely.' Such a case, recorded by so trustworthy and accurate an observer, might go far to upset all the doctrines I have been endeavouring to maintain with regard to the action of chloroform; and although I do not attempt to explain the phenomena, I would desire to draw attention to two points in the history, which I think, if rightly considered, will deprive the case of much of its apparent importance. In the first place, then, the patient was suffering at the time from tetanus, a disease characterized by the most violent spasmodic contraction of the voluntary muscles, and sometimes, there is good reason to believe, of the involuntary also; and in the second place, let it be remarked that the pulse stopped suddenly at the time Mr. Paget was trying to force open the mouth.

"If we admit that shock from mechanical injury may sometimes take place during the anæsthetic condition, the importance of always insisting on the horizontal position during the performance of operations while in this state will be evident; for then, if shock, and its consequence syncope, should occur, the danger of its proving fatal will be greatly lessened. But while, for my own part, I feel tolerably confident that syncope, and even fatal syncope, is sometimes produced under the circumstances I have mentioned, I fully acknowledge that, before the fact can be established, more observations must be made, more cases of death accurately observed, and the entire subject more fully and carefully investigated."—*Monthly Journ. Med. Sci.* Sept. 1853.

73. *Tartrate of Antimony*.—Edinburgh Physiological Society, February 5, 1853. Dr. HALDANE gave the result of some experiments on the urine of a horse, to which large doses of tartrate of antimony had been administered. It was a remarkable fact that doses of an ounce or even larger quantities of tartar-emetic could be administered to the horse for a length of time without producing any effect whatever. In the urine of a horse so treated, Dr. H. had by careful analysis detected antimony, but only in very minute quantity.—*Monthly Journal of Medical Science*, February, 1853. T. R. B.

74. *Mineral Constituents of the Human Body. Arsenic*.—Devergie and Orfila believed that they had found arsenic in all animal bones, and hence that it should be regarded as an integral constituent of the animal organism. Subsequent investigations have, however, shown that there must have been some fallacy in the method of analysis pursued by these chemists, and that this view is altogether erroneous.

When positive experiments seemed to show that arsenic existed in the bones, chemists thought they had found an explanation of the apparent fact in the circumstance that phosphorus and arsenic are so frequently associated together; if the discovery of Walehner and Shaffhault, that the sediment of most chalybeate waters contain arsenic, had then been known, they would doubtless have been regarded as strong additional proof of the presence of arsenic in the animal organism.

Arsenic acts in so noxious a manner on the animal organism, even in the

smallest doses (as we see from experiments with animals), that nature actively eliminates this deleterious substance as rapidly as possible from the body.

Meurer has made experiments on horses (animals which, as is well known, can bear large doses of arsenic), and Von Bibra on rabbits, from whence it appears that most of the arsenic is carried off with the solid excrements. Both observers also found the poison in the urine in no inconsiderable quantity. Of the solid parts of the animal body, the excreting organs, viz. the liver and kidneys, are those in which most arsenic is found; it has, however, also been detected in the heart, lungs, brain, and muscles. Some of these results are confirmed by the experiments of Duflos and Hirsch.

Schnedermann and Knop could detect no arsenic in the bones of a pig which had lived for three quarters of a year in the neighbourhood of the silver works of Andreasberg, where cattle and poultry do not thrive in consequence of the evolution of arsenical vapours.—*Lehmann's Physiological Chemistry*, vol. i. p. 449. Translated by Dr. GEORGE E. DAY. Cavendish Society Publications.

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75. *Mineral Constituents in the Human Body. Copper and Lead.*—Both these metals have been found in very minute quantity in the healthy body by Devergie, Lefortier, Orfila, Dechamps, and Millon, and were regarded by these chemists as integral constituents of all the soft parts, as well as of the blood; but it is only recently that any very decisive experiments on this subject have been instituted, and they, at all events, prove beyond a doubt that copper exists in the blood of some of the lower animals, and in the bile of the ox and man.

Millon believed that he had found them in the *blood*, but Melsens has brought forward reasons and even direct experiments against this view. Since, however, the presence of copper in the bile of man and the ox has been determined with certainty, the blood must give traces of this metal even though they be almost inappreciable. Moreover, E. Harless has found copper in the blood and more particularly in the liver of some of the lower animals, viz. the cephalopoda, ascidia, and mollusca. This observer found copper in the liver of *helix pomatia*; Von Bibra found it in the liver of cancer pagyurus, acanthias, and Zeus, and observed that it stood in an inverse ratio to the iron. Copper was originally found in the gall and bile stones by Bertozzi, and subsequently by Heller, Gorup Besanez, Bramson, and Orfila. I have been equally unsuccessful in demonstrating the presence of copper, either in the human liver or the liver of the frog; in the latter case, my experiment was made on 250 livers; and I have also failed in obtaining any indication of copper or lead in the blood, although I followed Millon's instructions.

There can be no doubt that the small quantities of copper which have been actually found in the fluids of the higher animals are only to be regarded as incidental constituents, while the experiments of Harless seem to indicate that, in the lower animals, the copper stands in an essential relation to the blood-corpuscles.

All the investigations which have hitherto been made seem to indicate the liver as the organ in which deleterious substances, and especially those of a metallic nature, as, for instance, arsenic, lead, antimony, bismuth, &c., are accumulated in order that they may gradually be eliminated with the bile. Hence, even if copper were constantly found in the blood or in the bile, it would afford no reason why we should regard this metal as an integral constituent of those fluids.

As copper has not only been found in many mineral waters (as, for instance, by Will, Buehner, Keller, and Fischer), but often in plants, and even in eorn (Girardin), there is no difficulty in accounting for its presence in small quantities in the organisms of the higher animals.—*Lehmann's Physiological Chemistry*.

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76. *Hydrocyanic Acid.*—This acid never occurs preformed in the animal organism; even in the most varied of the metamorphoses and decompositions which occur during disease, we never meet with either the free acid or a metallic cyanide. This is readily accounted for when we recollect that hydrocyanic